CLAIMS

What Is Claimed Is:

[1] A spring steel wire having a tempered martensitic structure brought about by quenching-tempering, the spring steel wire comprising:

a 40 % or higher reduction of area; and

a 1,000 Mpa or higher shear yield stress after subjected to heat treatment for at least 2 hours at a temperature ranging from 420°C to 480°C.

[2] The spring steel wire according to claim 1 consisting of, based on mass %, C: 0.50-0.75%, Si: 1.80-2.70%, Mn: 0.1-0.7%, Cr: 0.70-1.50%, Co: 0.02-1.0%, and remnants consisting of Fe and impurities.

[3] The spring steel wire according to claim 1 consisting of, based on mass %, C: 0.50-0.75%, Si: 1.80-2.70%, Mn: over 0.7-1.5%, Cr: 0.70-1.50%, and remnants consisting of Fe and impurities.

[4] The spring steel wire according to claim 1 consisting of, based on mass %;

C: 0.50-0.75%, Si: 1.80-2.70%, Mn: over 0.7-1.5%, Cr: 0.70-1.50%;

at least one element of Ni: 0.1-1.0% and Co: 0.02-1.00%; and

remnants consisting of Fe and impurities.

[5] The spring steel wire according to claim 1 consisting of, based on mass %;

C: 0.50-0.75%, Si: 1.80-2.70%, Mn: 0.1-0.7%, Cr: 0.70-1.50%, Co: 0.02-1.00%;

at least one element selected from the group of 5 elements consisting of V: 0.05-0.50%, Mo: 0.05-0.50%, W: 0.05-0.15%, Nb: 0.05-0.15% and Ti: 0.01-0.20; and

remnants consisting of Fe and impurities.

[6] The spring steel wire according to claim 1 consisting of, based on mass %;

C: 0.50-0.75%, Si: 1.80-2.70%, Mn: over 0.7-1.5%, Cr: 0.70-1.50%;

at least one element selected from the group of 5 elements consisting of V: 0.05-0.50%, Mo: 0.05-0.50%, W: 0.05-0.15%, Nb: 0.05-0.15% and Ti: 0.01-0.20%; and

remnants consisting of Fe and impurities.

[7] The spring steel wire according to claim 1 consisting of, based on mass %, C: 0.50-0.75%, Si: 1.80-2.70%, Mn: over 0.7-1.5%, Cr: 0.70-1.50%, at least one element of Ni: 0.1-1.0% and Co: 0.02-1.00%, at least one element selected from the group of 5 elements consisting of V: 0.05-0.50%, Mo: 0.05-0.50%, W: 0.05-0.15%, Nb: 0.05-0.15% and Ti: 0.01-0.20%, and remnants consisting of Fe and impurities.

[8] The spring steel wire according to any one of the claims 1 through 7 comprising austenite grains (prior austenite grains) which have an average grain size in the range of 3.0-7.0 μm.

[9] A spring manufactured from the spring steel wire according to any one of the claims 1 through 7.

[10] A spring manufactured from the spring steel wire according to claim 8.

[11] A method of manufacturing a spring steel wire, comprising the steps of:

patenting a steel consisting of chemical compositions given below;

drawing the thus patented steel into a steel wire; and

subjecting the resultant steel wire to quenching-tempering;

wherein said patenting process comprises:

an austenization step in which the steel is heated at 900-1,050°C for 60 to 180 seconds; and

an isothermal transformation step in which the thus austenized steel is heated at 600-750°C for 20 to 100 seconds;

Chemical compositions (based on mass %):
C: 0.50-0.75%, Si: 1.80-2.70%, Mn: 0.1-0.7%, Cr: 0.70-1.50%, Co: 0.02-1.00%, and remnants consisting of Fe and impurities.

[12] A method of manufacturing a spring steel wire, comprising the steps of:

patenting a steel consisting of chemical compositions given below;

drawing the thus patented steel into a steel wire; and

subjecting the resultant steel wire to quenching-tempering;

wherein said patenting process comprises:

an austenization step in which the steel is heated at 900-1,050°C for 60 to 180 seconds; and

an isothermal transformation step in which the thus austenized steel is heated at 600-750°C for 20 to 100 seconds;

Chemical compositions (based on mass %):
C: 0.50-0.75%, Si: 1.80-2.70%, Mn: over 0.7-1.5%, Cr: 0.70-1.50%, and remnants consisting of Fe and impurities.

[13] A method of manufacturing a spring steel wire, comprising the steps of:

patenting a steel consisting of chemical compositions given below;

drawing the thus patented steel into a steel wire; and

subjecting the resultant steel wire to quenching-tempering;

wherein said patenting process comprises:

an austenization step in which the steel is heated at 900-1,050°C for 60 to 180 seconds; and

an isothermal transformation step in which the thus austenized steel is heated at 600-750°C for 20 to 100 seconds;

Chemical compositions (based on mass %):
C: 0.50-0.75%, Si: 1.80-2.70%, Mn: over 0.7-1.5%, Cr: 0.70-1.50%, at least one element of Ni: 0.1-1.0% and Co: 0.02-1.00%, and remnants consisting of Fe and impurities.